

WHAT IS CLAIMED IS:

- 5 1. A filter comprising an absorptive system containing:
 a polymer matrix substantially free of polymer crosslinking;
and
 one or more reactive additives in contact with the polymer
matrix.
- 10 2. The filter of Claim 1, wherein the polymer matrix comprises a
polymer having a diffusivity of greater than 10^{-8} cm²/sec, and a T_g of less
than about 20°C.
- 15 3. The filter of Claim 2, wherein the polymer is selected from the
group consisting of polyethylene/polypropylene random copolymers,
poly(dimethylsiloxane), styrene-butadiene random and block copolymers,
poly(vinyl chloride) plasticized with dioctyl phthalate, poly(acrylamide)
plasticized with water, poly(acrylamide) plasticized with glycerol, and
combinations thereof.
- 20 4. The filter of Claim 3, wherein the polymer comprises a high
molecular weight poly(acrylamide) having a weight average molecular
weight ranging from about 1 million to about 50 million.
- 25 5. The filter of Claim 1, wherein the one or more reactive additives
comprise water, catalytic reactants, stoichiometric reactants,
catalytic/stoichiometric reactants, acid-scavenging agents, base-
scavenging agents, reactive nanoparticles, or a combination thereof.
- 30 6. The filter of Claim 5, wherein the one or more reactive additives
comprise a combination of acid-scavenging agents and base-scavenging
agents physically separated from one another within the filter.

7. The filter of Claim 6, wherein the one or more reactive additives comprise one or more of a transition metal, a transition metal salt, sulfonic acid, a carboxylic acid, a phosphoric acid, a benzoic acid, NaOH, ethylene diamine, an amine, Na₂CO₃, a primary amine, and water.

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8. The filter of Claim 7, wherein the one or more reactive additives comprise sulfonic acid and water.

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9. The filter of Claim 7, wherein the one or more reactive additives comprise an amine and water.

10. The filter of Claim 7, wherein the one or more reactive additives comprise reactive nanoparticles.

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11. The filter of Claim 1, wherein the one or more reactive additives are uniformly distributed throughout the polymer matrix.

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12. The filter of Claim 1, wherein the one or more reactive additives form a layer that is separate from but in contact with the polymer matrix.

13. The filter of Claim 1, wherein the absorptive system further comprises:

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one or more non-volatile species within the absorptive system, wherein the one or more non-volatile species are reaction products resulting from one or more reactions with the one or more reactive additives within the absorptive system.

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14. The filter of Claim 1, wherein the absorptive system is capable of (i) oxidation reactions on an outer surface of the polymer matrix, and (ii) hydrolysis reactions, acid/base reactions, condensation reactions, nucleophilic reactions, and electrophilic reactions within a bulk volume of the polymer matrix.

15. The filter of Claim 1, wherein the absorptive system further comprises one or more non-reactive additives.

16. The filter of Claim 15, wherein the one or more non-reactive additives comprise one or more of sorbitol, water and glycerol.

17. The filter of Claim 1, wherein the absorptive system comprises a high molecular weight poly(acrylamide) having a weight average molecular weight ranging from about 1 million to about 50 million, sulfonic acid beads, sorbitol, water and glycerol.

18. The filter of Claim 1, further comprising a substrate, wherein the absorptive system coats at least a portion of an outer surface of the substrate.

19. The filter of Claim 18, wherein the substrate comprises a non-woven fabric, a woven fabric, a knitted fabric, a film, a foam, a honeycomb structure, particulate material, a mesh or screen, a fiber, a flake, a powder, a wood product, paper, a glass sheet or bead, a ceramic bead, a polymeric bead, plywood, gypsum board, a ceiling tile, or any combination thereof.

20. The filter of Claim 19, wherein the substrate comprises a non-woven fabric, a woven fabric, a knitted fabric, a film, a foam, a honeycomb structure, particulate material, a mesh or screen, a fiber, a flake, a powder, or a polymeric bead; and wherein the substrate is formed from polyolefin, polyethylene, polypropylene, a polyester, a polyamide, nylon 6, nylon 66, a cellulosic material, or a combination thereof.

21. The filter of Claim 19, wherein the substrate comprises a polyamide non-woven fabric.

22. The filter of Claim 18, further comprising a housing to at least partially contain the absorptive system, the substrate or both.

23. A method of removing one or more particles or volatile or semi-volatile compounds from a fluid stream, said method comprising:

bringing the fluid stream and the filter of Claim 1 into contact with one another.

24. A filter comprising:

an absorptive system containing (i) a polymer matrix substantially free of crosslinking, wherein the polymer matrix contains at least one polymer selected from the group consisting of poly(acrylamide), polyethylene/polypropylene random copolymers, poly(dimethylsiloxane), styrene-butadiene random and block copolymers, and poly(vinyl chloride) plasticized with dioctyl phthalate; and (ii) one or more reactive additives in contact within the polymer matrix;

a substrate, wherein the absorptive system coats at least a portion of an outer surface of the substrate; and

an optional housing to at least partially contain the absorptive system, the substrate or both.

25. The filter of Claim 24, wherein the absorptive system comprises:

from about 5 percent by weight (pbw) to about 95 pbw of at least one polymer selected from the group consisting of poly(acrylamide), polyethylene/polypropylene random copolymers, poly(dimethylsiloxane), styrene-butadiene random and block copolymers, and poly(vinyl chloride) plasticized with dioctyl phthalate; and

from about 95 pbw to about 5 pbw of one or more reactive additives selected from the group consisting of a transition metal, a transition metal salt, sulfonic acid, a carboxylic acid, a phosphoric acid, a benzoic acid, NaOH, ethylene diamine, an amine, Na₂CO₃, a primary amine, and water, wherein the pbw are based on a total weight of the absorptive system.

26. The filter of Claim 25, wherein the absorptive system further comprises water.

27. The filter of Claim 24, wherein the substrate comprises a non-woven fabric, a woven fabric, a knitted fabric, a film, a foam, a honeycomb structure, particulate material, a mesh or screen, a fiber, a flake, a powder, a wood product, paper, a glass sheet or bead, a ceramic bead, a polymeric bead, plywood, gypsum board, a ceiling tile, or any combination thereof.

28. The filter of Claim 24, wherein the substrate comprises a non-woven fabric, a woven fabric, a knitted fabric, a film, a foam, a honeycomb structure, particulate material, a mesh or screen, a fiber, a flake, a powder, or a polymeric bead; and wherein the substrate is formed from polyolefin, polyethylene, polypropylene, a polyester, a polyamide, nylon 6, nylon 66, a cellulosic material, or a combination thereof.

29. The filter of Claim 28, wherein the substrate comprises a polyamide non-woven fabric.

30. A method of removing particles or one or more volatile or semi-volatile compounds from a fluid stream, said method comprising:
bringing the fluid stream and the filter of Claim 24 in contact with one another.

31. The method of Claim 30, wherein the fluid stream comprises an air stream.

32. A method of removing particles or one or more volatile or semi-volatile compounds from a fluid stream, said method comprising the steps of:

bringing the fluid stream into contact with a filter, wherein the filter comprises:
an absorptive system containing an absorptive system containing:

(i) a polymer matrix substantially free of crosslinking, wherein the polymer matrix contains at least one polymer selected from the group consisting of poly(acrylamide), polyethylene/polypropylene random copolymers, poly(dimethylsiloxane), styrene-butadiene random and block copolymers, and poly(vinyl chloride) plasticized with dioctyl phthalate; and

(ii) one or more reactive additives in contact within the polymer matrix;

an optional substrate, wherein the absorptive system coats at least a portion of an outer surface of the substrate; and

an optional housing to at least partially contain the absorptive system, the substrate or both.